Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/500
POLAND

February 1964

Submitted in:
ENGLISH and RUSSIAN

Confidential until official release during Conference

Abstract

RECENT DEVELOPMENTS IN CONTROL AND SAFETY SYSTEMS FOR NUCLEAR REACTORS AT THE INSTITUTE OF NUCLEAR RESEARCH IN POLAND

J.Podgórski, P.Szulc
Institute of Nuclear Research, Świerk, Poland

In this paper there are discussed the control and safety systems of the ANNA critical assembly and the MARYLA low-power, swimming-pool type reactor, both put into operation at the ŚWIERK Centre in 1963, as well as further developments in the control systems for nuclear reactors being designed at present in Poland.

The ANNA critical assembly as a nuclear model of the high - flux research reactor of /20-30 MW/ has been equipped with a control system more ample than that which would be required usually for a critical assembly, in order to accumulate experience on its operation. This system consists of the following main measuring channels:

1/ Pulse start - up channel /two-lines/ controlling the reactor period in a 5-decade power range.
2/ Current logarithmic channel /two identical lines/ controlling the reactor period in a 5-decade power range.
3/ Current linear channel /three identical lines in "2 out of 3" system/ controlling the power-level in a two-decade range.
4/ Automatic power-level regulation channel.

The electronic equipment in that system contains special reliability-controlling circuits. In the linear channel a special comparative circuit with constant relative sensitivity independent from power-level has been developed.

The control and safety system of the MARYLA reactor consists of the following

channels:

1/ Current logarithmic channel, with two identical lines which controls the reactor period in about 7 decades /1 mW - several kW/ power range.

2/ Current linear multi-range channel, operating in a controlled "2 out of 3" system, covering a power-range from 50 mW up to 1 kW.

3/ II step safety channel in controlled "2 out of 3" system with adjustable trip-levels in a power range of hundreds W up to several kW, with G.M. current counters as "gamma power" detectors.

Logarithmic and linear channels serve to measure and secure the reactor period and power-level. The II step safety channel plays a role of additional "fuse". Its action shuts down the reactor by ejection of a fuel element section. The transistorized pulse start-up channel and automatic power-level regulation channel are in their design stage.

The paper desoribes both control systems and the related electronic equipment, detectors and control-rod drive mechanisms.

At present, two new control and safety systems for 5 MW and 30 MW research reactors are being developed. The new system /a modified controlled "2 out of 3" system/ of high structural reliability is being tested. The multipoint control high-speed-switch equipment for temperature and flow-rate measurements is in the design stage.